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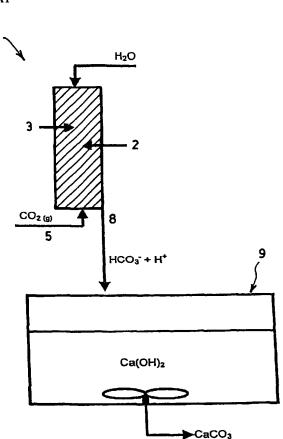
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[Continued on next page]

(54) Title: A PROCESS AND AN APPARATUS FOR PRODUCING CALCIUM CARBONATE VIA AN ENZYMATIC PATHWAY



(57) Abstract: The invention relates to a method for improving the production yield of precipitated calcium carbonate (PCC). The improvement resides in the use of an enzymatic bioreactor that supplies HCO<sub>3</sub> into the reaction enabling to produce PCC without bubbling gaseous carbon dioxide in the aqueous solution. The present invention has an industrial applicability, namely in the pulp and paper industry.





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A. CLASSIFICATION OF SUBJECT MATTER IPC 7 C12P3/00 C12M1740

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Minimum documentation searched (classification system followed by classification symbols) IPC 7 C12P C12M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, CHEM ABS Data, BIOSIS, PAJ

C. DOCUM	ENTS CONSIDERED TO BE RELEVANT			
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
P,X	CA 2 352 626 A (CO2 SOLUTION INC) 12 January 2003 (2003-01-12) the whole document	1-5		
P,A	SHIMOMURA, NORIYUKI ET AL: "Control of the production amount and polymorphism of calcium carbonate by biomimetic mineralization" CHEMISTRY LETTERS, vol. 31, no. 9, September 2002 (2002-09), pages 902-903, XP009019773 abstract page 902, column 1, line 38 - line 43 -/	1-14		

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χ Further documents are listed in the continuation of box C.	Patent family members are listed in annex.
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## INTERNATIONAL SEARCH REPORT

national Application No

		PCT/C	/01070
C.(Continua	ation) DOCUMENTS CONSIDERED RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages		Relevant to claim No.
X	WO 98 55210 A (BLAIS REJEAN ; ROGERS PETER A (CA); SYSTEMES ENVIROBIO INC (CA)) 10 December 1998 (1998-12-10) cited in the application claim 1		1-14
Α	DATABASE CA 'Online! CHEMICAL ABSTRACTS SERVICE, COLUMBUS, OHIO, US; 12 August 1978 (1978-08-12) TABATA, H. ET AL.: "Separation of Calcium from a Solution Containing Calcium and Magnesium" Database accession no. 89:61929 XP002260760 abstract & JP 52 138477 A (KINKAI KAISUI KOGYO KK) 18 November 1977 (1977-11-18)		1–14
A	US 6 387 212 B1 (CHRISTIAN RICHARD) 14 May 2002 (2002-05-14) claim 1		1–14
Α	LUCAS JARED M ET AL: "A physiological evaluation of carbon sources for calcification in the octocoral Leptogorgia virgulata (Lamarck)" JOURNAL OF EXPERIMENTAL BIOLOGY, vol. 200, no. 20, October 1997 (1997-10), pages 2653-2662, XP002260714 ISSN: 0022-0949 abstract; figure 2		1–14
<b>A</b>	FURLA, PAOLA ET AL: "Sources and mechanisms of inorganic carbon transport for coral calcification and photosynthesis" JOURNAL OF EXPERIMENTAL BIOLOGY, vol. 203, no. 22, 24 October 2000 (2000-10-24), pages 3445-3457, XP001155745 abstract; figure 8		1-14

## INTERNATIONAL SEARCH REPORT

Information on patent family members

PCT/CA=3/01070

Patent document cited in search report	-	ablication date		Patent family member(s)	Publication date
CA 2352626	Α	12-01-2003	CA	2352626 A1	12-01-2003
			CA US	2392950 A1 2003027023 A1	12-01-2003 06-02-2003
WO 9855210		10-12-1998	AT	238094 T	15-05-2003
110 JOUGE 2			AU	7753398 A	21-12-1998
			WO	9855210 A1	10-12-1998
			DE	69813811 D1	28-05-2003
			ΕP	0991462 A1	12-04-2000
			JP	2002508702 T	19-03-2002
			US	6524843 B1	25-02-2003
JP 52138477	Α	18-11-1977	 JP	1099196 C	18-06-1982
			JP	56044015 B	16-10-1981
US 6387212	B1	14-05-2002	FR	2775197 A1	27-08-1999
00 0001.222			FR	2775301 A1	27-08-1999
			ΑT	252181 T	15-11-2003
			AU	762430 B2	26-06-2003
			AU	2430799 A	06-09-1999
			BR	9908118 A	24-10-2000
			CA	2318387 A1	26-08-1999
			CN	1291248 T	11-04-2001
			DE	69912142 D1	20-11-2003
			EP	1114219 A1	11-07-2001
			WO	9942657 A1	26-08-1999
			ID	25919 A	09-11-2000
			JP	2002504634 T	12-02-2002